



**CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC)  
HUMAN AND ECOLOGICAL RISK DIVISION (HERD)**

**HUMAN HEALTH RISK ASSESSMENT (HHRA) NOTE**

**HERD HHRA NOTE NUMBER: 1**

**ISSUE DATE:** October 27, 2005

**ISSUE:** Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Military Facilities.

**SUMMARY**

The attached table summarizes exposure factors which may be used as default values in human health risk assessments for California military facilities. The recommended values were obtained primarily from USEPA and Cal-EPA DTSC guidance documents, and references for each of the exposure factors are provided. The values shown should generally be used to calculate reasonable maximum exposure (RME) estimates for residential, industrial, and construction worker receptors. Site-specific data may warrant deviation from these values. For any cases in which site specific alternate values are used, appropriate justification and documentation should be included in the risk assessment report.

Note that the default exposure parameter values listed in this table are summarized for California military facilities only, and may not be appropriate for use at other properties (e.g. non-military facilities, schools). Therefore, the other HERD Section Chiefs<sup>1</sup> should be consulted for default exposure factors to be used at properties other than military facilities.

**HERD ISSUE CONTACT PERSONS:**

Michael Wade, Senior Toxicologist  
(916) 255-6653 Voice  
(916) 255-6695 Facsimile  
[MWade@dtsc.ca.gov](mailto:MWade@dtsc.ca.gov)

Tracy Taras, Staff Toxicologist  
(916) 255-6646 Voice  
(916) 255-6694 Facsimile  
[TTaras@dtsc.ca.gov](mailto:TTaras@dtsc.ca.gov)

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<sup>1</sup> Schools Section (Debbie Oudiz, Senior Toxicologist, 255-6647); Northern California Section (David Berry, Senior Toxicologist, 255-6626); Multimedia Section (Southern California) (Gerald Pollock, Senior Toxicologist, 255-6648)

# RECOMMENDED DTSC DEFAULT EXPOSURE FACTORS FOR USE IN RISK ASSESSMENT AT CALIFORNIA MILITARY FACILITIES

EXPOSURE PARAMETERS	RME SCENARIO		
	Residential	Industrial	Construction
<b>Body weight (BW)</b>			
adult (kg)	70 <sup>a,b</sup>	70 <sup>a,b</sup>	70 <sup>a,b</sup>
child (kg)	15 <sup>b,c</sup>		
<b>Averaging time (AT)</b>			
carcinogens (days)	25550 <sup>a,b</sup>	25550 <sup>a,b</sup>	25550 <sup>a,b</sup>
noncarcinogens (days)	ED x 365 <sup>a,b</sup>	ED x 365 <sup>a,b</sup>	ED x 365 <sup>a,b</sup>
<b>Exposure duration (ED)</b>			
adult (yr)	24 <sup>d</sup>	25 <sup>b,c</sup>	Site-specific HERD default = 1
child (yr)	6 <sup>d</sup>		
<b>Exposure frequency (EF)</b>			
(days/yr)	350 <sup>b,c</sup>	250 <sup>b,c</sup>	Site-specific HERD default = 250
<b>Inhalation rate (InhR)</b>			
adult	20 (m <sup>3</sup> /day) <sup>b,c</sup>	14 m <sup>3</sup> /day for the 8 hr workday <sup>e</sup>	20 m <sup>3</sup> /day for the 8 hr workday <sup>f</sup>
child	10 (m <sup>3</sup> /day) <sup>b,d</sup>		
<b>Drinking water ingestion (IR)</b>			
adult (L/day)	2 <sup>a,b</sup>	2 <sup>f</sup>	0, HERD default = 2 if on-site water is consumed
child (L/day)	1 <sup>b,d</sup>		
<b>Soil ingestion (IR)</b>			
adult (mg/day)	100 <sup>a,b</sup>	100 <sup>f</sup>	330 <sup>f</sup>
child (mg/day)	200 <sup>a,b</sup>		
<b>Particulate emission factor (PEF)</b>			
(m <sup>3</sup> /kg)	1.316E+09 <sup>b</sup>	1.316E+09 <sup>b</sup>	1.0E+06 <sup>g</sup>
<b>Skin surface area for soil contact (SA)</b>			
adult (cm <sup>2</sup> )	5700 <sup>h</sup>	5700 <sup>h</sup>	5700 <sup>h</sup>
child (cm <sup>2</sup> )	2900 <sup>h</sup>		
<b>Soil adherence factor (AF)</b>			
adult (mg/cm <sup>2</sup> )	0.07 <sup>h</sup>	0.2 <sup>h</sup>	0.8 <sup>h</sup>
child (mg/cm <sup>2</sup> )	0.2 <sup>h</sup>		
<b>Dermal absorption fraction (ABS)</b>			
(unitless)	See Appendix A <sup>i</sup>	See Appendix A <sup>i</sup>	See Appendix A <sup>i</sup>

Dermal permeability coefficient from water (Kp)			
(cm/hr)	Chemical specific <sup>j</sup>	Chemical specific <sup>j</sup>	Chemical specific <sup>j</sup>

  

Showering/Bathing Scenario <sup>k</sup>			
Skin surface area for water contact (SA) (cm <sup>2</sup> )			
adult	18,000		
child	6,600		
Exposure time (ET)			
adult	0.58 hr/day		
child	1 hr/day		
Exposure frequency (EF) (days/yr)	350		

## REFERENCES

<sup>a</sup> US EPA 1989, Risk Assessment Guidance for Superfund (RAGS) (Part A), EPA/540/1-89/002

<sup>b</sup> US EPA 2004, Region 9 Preliminary Remediation Goals. Memorandum from Stanford Smucker, Ph.D., Regional Toxicologist. (<http://www.epa.gov/region09/waste/sfund/prg/index.html>). Note that the default PEF value listed for residential and industrial workers corresponds to a receptor point dust concentration of approximately 0.76 µg/m<sup>3</sup>.

<sup>c</sup> US EPA 1991, RAGS Volume I: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors", OSWER No. 9285.6-03

<sup>d</sup> Cal-EPA DTSC 1994 (Second Printing 1999), Preliminary Endangerment Assessment (PEA) Guidance Manual

<sup>e</sup> Cal-EPA DTSC estimated this value based on the following study cited in the US EPA Exposure Factors Handbook 1997 (EPA/600/P-95/002Fa): Linn W.S, Spier C.E., and J.D. Hackney. 1993. Activity patterns in ozone-exposed construction workers. J. Occ. Med. Tox. 2(1): 1-14.

<sup>f</sup> US EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24

<sup>g</sup> This PEF value corresponds to a respirable dust concentration of 1 mg/m<sup>3</sup>. This is based on a maximum concentration of dust in air of 10 mg/m<sup>3</sup> recommended by the American Conference of Governmental Industrial Hygienists (ACGIH 2004, Threshold Limit Values and Biological Exposure Indices), and the assumption that 10 percent of the mass of particles are in the respirable PM10 range.

<sup>h</sup> Cal-EPA DTSC Draft 2000. Draft memorandum from S. DiZio, M. Wade, and D. Oudiz. Guidance for the Dermal Exposure Pathway. The DTSC recommendations detailed in the Draft 2000 memorandum were partially based on US EPA RAGS (Part E) Supplemental Guidance for Dermal Risk Assessment, Interim Guidance (1998). As discussed in the Draft 2000 memorandum, DTSC recommends that the skin surface area for industrial workers be set as 5700 cm<sup>2</sup> based on California's more temperate climate as compared to other, colder, areas of the United States.

<sup>i</sup> The dermal absorption fraction values listed in Appendix A are from the Cal-EPA DTSC PEA Guidance Manual, January 1994 (Second Printing 1999). Please consult the PEA Guidance Manual for citations for each of the values shown in the appendix. Also, note that the dermal absorption fraction for volatile organic compounds (VOCs) from soil can be assumed to be zero. This is based on the assumption that VOCs volatilize from soil on skin and should be evaluated via the inhalation exposure pathway from soil.

<sup>j</sup> Consult USEPA 2004, RAGS (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005. Exhibits B-3 and B-4 list K<sub>p</sub> values for organic and inorganic chemicals, respectively, in water. While dermal absorption of various chemicals from water may represent a minor exposure pathway relative to others (e.g. oral absorption), HERD recommends that the dermal exposure pathway be quantitatively evaluated for all chemicals of potential concern.

<sup>k</sup> USEPA 2004, RAGS (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005.

## APPENDIX A

### SCREENING LEVEL DERMAL ABSORPTION FRACTIONS (ABS) FROM SOIL

Compound Class	Absorption Fraction
Chlorinated Insecticides	.05
Polynuclear Aromatic Hydrocarbons (PAHs)	.15
Organophosphates	.25
Pentachlorophenol	.25
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans	.03
Polychlorinated Biphenyls (PCBs)	.15
Other Organic Chemicals	.1
Cadmium	.001
Arsenic	.03
Hexavalent Chromium	0%
Other metals and complexed cyanides	.01
Free Cyanide	.1

(Source: Cal-EPA DTSC 1994 (Second Printing 1999), Preliminary Endangerment Assessment (PEA) Guidance Manual)